GRUBER
FOUNDATION

Contact:
Alyson O'Mahoney
Robin Leedy & Associates
+1 914-241-0086 ext. 13
aomahoney@robinleedyassociates.com

Bernetia Akin
The Peter and Patricia Gruber Foundation
140 W 57th St Suite 10C
New York, NY 10019
+1 340-775-4430
media@gruberprizes.org

Online Newsroom: www.gruberprizes.org/Press.php

FOR IMMEDIATE RELEASE

STEIDEL RECEIVES $500,000 GRUBER COSMOLOGY PRIZE FOR OBSERVATIONS OF EARLIEST GALAXIES

Charles Steidel

June 2, 2010, New York, New York – Charles Steidel, the Lee A. DuBridge Professor of Astronomy at the California Institute of Technology, is the recipient of the 2010 Cosmology Prize of The Peter and Patricia Gruber Foundation in recognition of his revolutionary studies of the most distant galaxies in the universe.

"Professor Steidel pioneered the techniques needed to find young galaxies and led the efforts that have opened a direct observational window to a time when the Universe was only about one tenth of its current age," reads the official citation. Steidel will receive the $500,000 award, as well as a gold medal, in October at the University of Chicago in Chicago, Illinois, where he will also deliver a lecture.

As recently as the 1920s, astronomers were uncertain whether our galaxy, the Milky Way, was the universe in its entirety. In 1923, Edwin Hubble found conclusive evidence that other galaxies exist outside our own. Six years later, he discovered that galaxies tend to be receding from one another at rates roughly proportional to their distances—the farther, the faster. While the discovery of cosmic expansion inaugurated a decades-long investigation into the implications of a universe that changes over time—including the Big Bang, the rate of the expansion, and the fate of the universe—Steidel's work is in a way a return to cosmology's roots: the galaxies themselves.

"My main scientific interest is, and has been, how the galaxies got there," says Steidel. How did the first galaxies form? When did they form? Has the way that galaxies form changed over time?

In order to answer these questions, astronomers need to observe galaxies at different stages of the universe's history. Because the speed of light is finite, the light from an object takes time to reach us. The more distant an object is, the longer its light has taken; the farther away in space it is, the further back in time. In the early 1990s, Steidel set out to discover an abundance of so-called "primordial galaxies," dating from a period more than 12 billion years ago, when the universe was less than two billion years old.

-more-

Astronomers had already observed a handful of objects at that distance, but most were extreme objects like quasars and not normal, star-forming galaxies. Steidel and his colleagues would try to make that determination using a technique that relies on a telltale signature in a galaxy's light spectrum. Stars, and therefore galaxies, are rich in hydrogen, and hydrogen absorbs radiation with wavelengths shorter than 91.2 nanometers (billionths of a meter)—what astronomers call the Lyman limit. As a result, galaxies are mostly invisible below the Lyman limit, in the far ultraviolet region of the electromagnetic spectrum, but visible above it. Although light with a wavelength of 91.2 nanometers is not accessible on Earth due to the interference of the atmosphere, Steidel and his colleagues knew that the expansion of the universe would stretch the length of the waves until they are visible. And they knew a wave of light with a length of 91.2 nanometers that has traveled 12 billion light-years would have stretched to a length of 360 nanometers. If they could observe these distant objects and detect a sharp cutoff, or break, at that wavelength, they would know the objects were galaxies.

After outlining their approach in papers now considered classics, Steidel and his colleagues discovered their first batch of Lyman Break Galaxies in October 1995, using the recently-commissioned 10-meter W.M. Keck telescope in Hawaii, at that time the most powerful telescope on Earth.

"Chuck Steidel opened an exciting new window and view of galaxies forming in the early universe," said Dr. Wendy Freedman, chair of this year's Selection Advisory Board.

"It was a totally unexplored region," Steidel says. His team's subsequent observations showed that even at such an early point in the universe's evolution, galaxies were common.

In the past five years, Steidel has extended his study of galaxy formation by moving somewhat forward in time, to the period about 10 to 12 billion years ago—a peak era for star formation, supernova explosions, and the accumulation of gas by supermassive black holes. This year he is publishing his first paper about a new technique that uses multiple "skewers" of one-dimensional views through the universe to create a composite 3-D view of these highly active galaxies spewing gas into intergalactic space. Using this method, Steidel and his team have discovered that a galaxy can influence a region in space one hundred times the diameter of the galaxy itself.

"How do you efficiently find lots and lots of galaxies wherever you want to point in the sky at a particular distance in order to isolate a particular period in the history of the universe?" Steidel says. Over the past twenty years, he has provided many of the answers—and helped cosmology expand from the study of the evolution of the universe as a whole to the evolution of its parts.

Additional Information

The official citation reads:

The Peter and Patricia Gruber Foundation proudly presents the 2010 Cosmology Prize to Charles Steidel for his groundbreaking studies of the distant Universe.

Professor Steidel pioneered the techniques needed to find young galaxies and led the efforts that have opened a direct observational window to a time when the Universe was only about one tenth of its current age.

This breakthrough has allowed us to witness first-hand the dramatic transformation galaxies undergo throughout their lives, and has revolutionized, challenged, and inspired our current understanding of how structures form and evolve in the Universe.

Laureates of the Gruber Cosmology Prize

2009: Wendy Freedman, Robert Kennicutt and Jeremy Mould for the definitive measurement of the rate of expansion of the universe, Hubble's Constant
2008: J. Richard Bond for his pioneering contributions to our understanding of the development of structures in the Universe
2007: Saul Perlmutter and Brian Schmidt and their teams: the Supernova Cosmology Project and the High-z Supernova Search Team, for independently discovering that the expansion of the Universe is accelerating
2006: John Mather and the Cosmic Background Explorer (COBE) Team for studies confirming that our universe was born in a hot Big Bang
2005: James E. Gunn for leading the design of a silicon-based camera for the Hubble Space Telescope and developing the original concept for the Sloan Digital Sky Survey
2004: Alan Guth and Andrei Linde for their roles in developing and refining the theory of cosmic inflation
2003: Rashid Alievich Sunyaev for his pioneering work on the nature of the cosmic microwave background and its interaction with intervening matter
2002: Vera Rubin for discovering that much of the Universe is unseen black matter, through her studies of the rotation of spiral galaxies
2001: Martin Rees for his extraordinary intuition in unraveling the complexities of the universe
2000: Allan R. Sandage and Phillip J. E. (Jim) Peebles: Sandage for pursuing the true values of the Hubble constant, the deceleration parameter and the age of the universe; Peebles for advancing our understanding of how energy and matter formed the rich patterns of galaxies observed today

The Prize recipients are chosen by the Cosmology Selection Advisory Board. Its members are:

Jacqueline Bergeron, Institut d'Astrophysique - CNRS
Wendy Freedman, The Observatories of the Carnegie Institution of Washington
Peter Galison, Harvard University
Ronald Ekers, Australia Telescope National Facility - CSIRO
Andrei Linde, Stanford University
Julio F. Navarro, University of Victoria
Roger Penrose, University of Oxford

Owen Gingerich of the Harvard-Smithsonian Center for Astrophysics, and **Virginia Trimble** of the University of California, Irvine, also serve as special cosmology advisors to the Foundation.

* * *

The Gruber Prize Program honors contemporary individuals in the fields of Cosmology, Genetics, Neuroscience, Justice and Women's Rights, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge, potentially have a profound impact on our lives, and, in the case of the Justice and Women's Rights Prizes, demonstrate courage and commitment in the face of significant obstacles.

* * *

The Peter and Patricia Gruber Foundation honors and encourages educational excellence, social justice and scientific achievements that better the human condition. For more information about Foundation guidelines and priorities, please visit www.gruberprizes.org.

Affiliation with International Astronomical Union

In 2000, The Peter and Patricia Gruber Foundation and the International Astronomical Union (IAU) announced an agreement by which the IAU provides its expertise and contacts with professional astronomers worldwide for the nomination and selection of Cosmology Prize winners. Under the agreement, The Peter and Patricia Gruber Foundation also funds a fellowship program for young astronomers, with the aim of promoting the continued recruitment of new talent into the field.

The International Astronomical Union, founded in 1919, is an organization of professional astronomers. It serves today a membership of more than 9,000 individual astronomers from 85 countries, worldwide. Information about the activities of the IAU is available from www.iau.org.

* * *

For more information on the Gruber Prizes email media@gruberprizes.org or contact Bernetia Akin of the Gruber Foundation at +1 (340) 775-4430 or by mail 140 W 57th St Suite 10C New York, NY 10019.

Media materials and additional background information on the Gruber Prizes can be found at **our online newsroom:** www.gruberprizes.org/Press.php

-end-